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| 09/520,149      | 03/07/2000  | Hiroshi Murakami     | 00169/P16954-02(I.S.Nakan | 9834             |

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EXAMINER

PEREZ, GUILLERMO

ART UNIT

PAPER NUMBER

2834

DATE MAILED: 02/08/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/520,149

Applicant(s)

MURAKAMI ET AL.

Examiner

Guillermo Perez

Art Unit

2834

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 2 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 17 January 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 49-94 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 49-94 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 17 September 2001 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

## DETAILED ACTION

### *Drawings*

The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on September 17, 2001 have been accepted. A proper drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The correction to the drawings will not be held in abeyance.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 49-66 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admitted Prior Art (APA) in view of Takahashi (EP 0642210 A1).

APA discloses a permanent magnet synchronous motor (21) having a stator (22) with a concentrated winding (23) such that adjacent teeth (22) have different polarities; wherein a permanent magnet (25) in the rotor (24) comprises a ferrite magnet. APA discloses that the stator (22) comprises a divided core (22) and that the motor (21) is driven in a sensor-less operation. However, APA does not disclose that relations of  $0.3 L_g < L_a < 2.0 L_g$ , and  $2 L_g < L_b < 5 L_g$  are established,

where  $L_a$  is a clearance between teeth of the stator;

$L_b$  is a depth of a tooth edge; and

Lg is an air-gap between the stator and a rotor. APA does not disclose that the motor drives a compressor used in one of an air-conditioner and an electric refrigerator. APA does not disclose that the rotor and stator are arranged such that Lg is not greater than 0.6 mm.

Takahashi discloses that a relation of  $0.3 L_g < L_a < 2.0 L_g$  is established, where  $L_a$  is a clearance between teeth of the stator; and

Lg is an air-gap between the stator and a rotor (column 13, lines 16-38). Takahashi discloses that the motor (figure 1) drives a compressor used in one of an air-conditioner and an electric refrigerator (column 1, lines 15-18). Takahashi discloses that the rotor (2) and stator (1) are arranged such that Lg is not greater than 0.6 mm (column 13, lines 34-38). Takahashi's invention have the purpose of facilitating manufacturing of the electric motor.

It would have been obvious at the time the invention was made to modify the permanent magnet synchronous motor of APA and provide it with the relation and the application disclosed by Takahashi for the purpose of facilitating manufacturing of the electric motor.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a relation between a depth of a tooth edge and the air-gap between the stator and a rotor since it has been held that where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

2. Claims 67-71 are rejected under 35 U.S.C. 103(a) as being unpatentable over APA in view of J. C. Macfarlane et al. (U. S. Pat. 1,761,836).

APA discloses a permanent magnet synchronous motor (21) having a stator (22) with concentrated windings (23) such that adjacent teeth (22) have different polarities. APA discloses that a permanent magnet (25) in the rotor (24) comprises a ferrite magnet. APA discloses that the stator (22) comprises a divided core. APA discloses that the motor (21) is driven in a sensor-less operation. However, APA does not disclose that at least one of said leading-side edge and said trailing-side edge having a bevel formed at a first end closest to said rotor and having a protrusion formed at a second end farthest from said rotor such that each side edge of each tooth is maintained at a substantially constant depth.

J. C. Macfarlane et al. disclose that at least one of said leading-side edge and said trailing-side edge ( $L^t$ ) having a bevel formed at a first end closest to said rotor (r) and having a protrusion formed at a second end farthest from said rotor (r) such that each side edge ( $T^t$ ,  $L^t$ ) of each tooth ( $p^t$ ) is maintained at a substantially constant depth. The invention of J. C. Macfarlane et al. has the purpose of producing a higher magnetic reluctance path.

It would have been obvious at the time the invention was made to modify the permanent magnet synchronous motor of APA and provide it with the stator of J. C. Macfarlane et al. for the purpose of producing a higher magnetic reluctance path.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use an electric motor to drive a compressor since it was known in the art that compressors for A/C or refrigerators are operated with electric motors.

3. Claims 72-77, and 81-83 are rejected under 35 U.S.C. 103(a) as being unpatentable over APA in view of Asai (JP 406245418A).

APA discloses a permanent magnet synchronous motor (21) having a stator (22) with a concentrated winding (23) such that adjacent teeth (22) have different polarities. APA discloses that the motor (21) is driven in a sensor-less operation. However, APA does not disclose an inwardly-tapered section being formed at each side of said outer wall with respect to the radial direction of said rotor so as to form a recessed section at each side of said permanent magnet. APA does not disclose that a relation of  $(.10)A_s < A_m < (.25)A_s$  is established,

where " $A_m$ " is an angle of an arc length of said tapered section at each side of said outer wall of said permanent magnet measured with respect to a central axis of said rotor; and

" $A_s$ " is an angle of an arc length of each tooth measured with respect to the central axis of said rotor. APA does not disclose that the permanent magnet is mounted on an outer wall of a rotor core, and a recessed section is formed at an open space from where both the end sections of the permanent magnet are cut away in the rim direction. APA does not disclose that the motor is used to drive the compressor of a A/C or refrigerator.

Asai discloses an inwardly-tapered section (62a) being formed at each side of said outer wall with respect to the radial direction of said rotor (61) so as to form a recessed section at each side of said permanent magnet (62). Asai discloses that the permanent magnet (62) is mounted on an outer wall of a rotor core (61), and a recessed section (62a) is formed at an open space from where both the end sections of the permanent magnet (62) are cut away in the rim direction. Asai's invention have the purpose of preventing an increase in gap loss.

It would have been obvious at the time the invention was made to modify the permanent magnet synchronous motor of APA and provide it with the permanent magnets and recessed sections of Asai for the purpose of preventing an increase in gap loss.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to establish a relation between an opening angle of a recessed section and an opening angle of teeth of the stator since it has been held that where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use an electric motor to drive a compressor since it was known in the art that compressors for A/C or refrigerators are operated with electric motors.

4. Claims 78-80, 84-89 are rejected under 35 U.S.C. 103(a) as being unpatentable over APA in view of Asai as applied to claim 7 above, and further in view of Tanimoto (JP 405304737).

APA and Asai disclose a permanent magnet synchronous motor (21) as described on item 3 above. However, neither APA nor Asai disclose that an inner wall of the permanent magnet facing a radial direction is flat face for increasing a depth of a center section of the permanent magnet in the rim direction. Neither APA nor Asai disclose that the permanent magnet is buried in a rotor core along a rotor-core rim, and a cut-away section is formed at a section corresponding to both the end sections of the permanent magnet in the rim direction. Neither APA nor Asai disclose that the permanent magnet is buried in a rotor core along a rotor-core rim, and a slit is formed at a section corresponding to both the end sections of the permanent magnet in the rim direction. Neither APA nor Asai disclose that said rotor further includes a spacer in said recessed section formed at each side of said permanent magnet.

Tanimoto discloses in figure 8 that an inner wall of the permanent magnet (36) facing a radial direction is flat face for increasing a depth of a center section of the permanent magnet (36) in the rim direction. Tanimoto discloses in figure 7 that the permanent magnet (26) is buried in a rotor core (22') along a rotor-core rim, and a cut-away section (a) is formed at a section corresponding to both the end sections of the permanent magnet (26) in the rim direction. Tanimoto discloses that the permanent magnet (26) is buried in a rotor core (22') along a rotor-core rim, and a slit (a) is formed at a section corresponding to both the end sections of the permanent magnet (26) in the

rim direction. Tanimoto discloses that said rotor further includes a spacer (a) in said recessed section (26) formed at each side of said permanent magnet (figure 7).

Tanimoto's invention have the purpose of reducing unnecessary cogging torque.

It would have been obvious at the time the invention was made to modify the permanent magnet synchronous motor of APA and Asai and provide it with the permanent magnets and slits as described by Tanimoto for the purpose of reducing unnecessary cogging torque.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use an electric motor to drive a compressor since it was known in the art that compressors for A/C or refrigerators are operated with electric motors.

5. Claims 90-94 rejected under 35 U.S.C. 103(a) as being unpatentable over APA in view of Reiter, Jr. et al. (U. S. Pat. 5,191,256).

APA discloses a permanent magnet synchronous motor (21) having a stator (22) with a concentrated winding (23) such that adjacent teeth (22) have different polarities. APA discloses that the motor is driven in a sensor-less operation. However, APA does not disclose that said rotor including a curved permanent magnet and a rotor core having a core rim, said permanent magnet being buried in said rotor core along said core rim such that a center of curvature of said permanent magnet is outside said rotor and such that a side end of said permanent magnet faces said rotor rim from inside said rotor rim, said rotor further including a spacer formed in said rotor at said side end of said permanent magnet. APA does not disclose that a relation of  $L_g < Q < 3 L_g$  is established,

where Q is a distance between the end of the permanent magnet and the rotor-core rim; and

Lg is an air-gap between the stator and the rotor. APA does not disclose that a relation of  $(.10)A_s < A_m < (.25)A_s$  is established,

where "Am" is an angle of an arc length of said spacer at said side end of said permanent magnet measured with respect to a central axis of said rotor; and

"As" is an angle of an arc length of each tooth measured with respect to the central axis of said rotor.

Reiter, Jr. et al. disclose that said rotor (40) including a curved permanent magnet (17) and a rotor core (40) having a core rim, said permanent magnet (17) being buried in said rotor core (40) along said core rim such that a center of curvature of said permanent magnet (17) is outside said rotor (40) and such that a side end of said permanent magnet (17) faces said rotor rim from inside said rotor rim, said rotor (40) further including a spacer (95) formed in said rotor (40) at said side end of said permanent magnet (17). The invention of Reiter, Jr. et al. have the purpose of minimizing flux leakage, hysteresis loss, eddy current loss, and heat production.

It would have been obvious at the time the invention was made to modify the permanent magnet synchronous motor of APA and provide it with the permanent magnets as disclosed by Reiter, Jr. et al. for the purpose of minimizing flux leakage, hysteresis loss, eddy current loss, and heat production.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to establish a relation between the distance from the end of the

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permanent magnet to the rotor-core rim "Q" and the air-gap between the stator and the rotor. Also it would have been obvious to establish a relation between the opening angle "Am" of the permanent magnet and the opening angle "As" of the teeth of the stator since it has been held that where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use an electric motor to drive a compressor since it was known in the art that compressors for A/C or refrigerators are operated with electric motors.

### ***Response to Arguments***

Applicant's arguments with respect to claims 67-71 and 90-94 have been considered but are moot in view of the new ground(s) of rejection.

In response to Applicant's argument that one of ordinary skill in the art would not look to neither the Takahashi, the Asai, nor the Tanimoto references to address the problems encountered in motors having concentrated windings, it must be noted that the motor of APA, Takahashi, Asai, and Tanimoto are directed to high power output motors. These motors are prone to eddy current losses which reduce the efficiency of the machine by creating a cogging torque problem. Takahashi addresses this problem by providing the specific air gap and teeth dimensions. Asai addresses this problem by providing a cover to enclose the magnetic and nonmagnetic regions. Tanimoto addresses this problem by

In response to Applicant's argument that Takahashi specifies that the air gap is 2.01 millimeters, it must be noted that Takahashi also discloses the knowledge of having air gaps measuring .005-.01 mm (column 1, lines 46-50). Also discloses air gaps measuring .16-.31 mm (column 13, 34-38), which fall within the claimed air gap dimension.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Guillermo Perez whose telephone number is (703) 306-5443. The examiner can normally be reached on Monday through Thursday and alternate Fridays.


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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nestor Ramirez can be reached on (703) 308 1371. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305 3432 for regular communications and (703) 305 3432 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308 0956.

Guillermo Perez  
February 6, 2002



Nicholas Ponomarenko  
Primary Examiner  
Technology Center 2800